

Roll No. ....

Question Booklet Number

O. M. R. Serial No.

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**M. Sc. (Biotechnology) (Fourth Semester)**  
**(NEP) EXAMINATION, 2025-26**  
**ONCOTECHNOLOGY**

Paper Code							
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Questions Booklet  
Series

**D**

Time : 1:30 Hours ]

[ Maximum Marks : 75

**Instructions to the Examinee :**

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

**परीक्षार्थियों के लिए निर्देश :**

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page)

(शेष निर्देश अन्तिम पृष्ठ पर)

*(Only for Rough Work)*

1. Which best explains radiation-induced cancer ?
  - (A) Protein denaturation
  - (B) RNA degradation
  - (C) Lipid oxidation
  - (D) DNA double-strand breaks
2. Chemical carcinogenesis involves which sequence ?
  - (A) Promotion → initiation → progression
  - (B) Initiation → promotion → progression
  - (C) Progression → initiation → promotion
  - (D) Mutation → repair → apoptosis
3. HPV E6 and E7 proteins cause cancer by :
  - (A) Activating Ras
  - (B) Inhibiting p53 and Rb
  - (C) Activating EGFR
  - (D) Inducing apoptosis
4. Which pathway is activated by both EGFR and IGFR ?
  - (A) MAPK and PI3K-Akt
  - (B) DNA repair
  - (C) Glycolysis
  - (D) Apoptosis
5. Why does loss of let-7 miRNA promote cancer ?
  - (A) Activates p53
  - (B) Inhibits Ras
  - (C) Enhances Ras signaling
  - (D) Blocks apoptosis
6. Which scenario indicates epigenetic regulation ?
  - (A) Gene deletion
  - (B) DNA mutation
  - (C) Histone acetylation
  - (D) Chromosomal translocation
7. Which mechanism explains Src-mediated metastasis ?
  - (A) DNA methylation
  - (B) FAK phosphorylation
  - (C) Histone acetylation
  - (D) RNA splicing
8. Why is CDC25 overexpression oncogenic ?
  - (A) Inhibits CDKs
  - (B) Blocks transcription
  - (C) Degrades DNA
  - (D) Activates CDKs

9. Loss of p53 and Rb simultaneously affects :
- (A) Angiogenesis
  - (B) Cell cycle checkpoints
  - (C) Immune evasion
  - (D) Metabolism
10. Mutation in Ras and overexpression of MYC together result in :
- (A) Reduced proliferation
  - (B) Increased apoptosis
  - (C) Enhanced tumor growth
  - (D) DNA repair
11. UV radiation induces which DNA damage ?
- (A) Pyrimidine dimers
  - (B) Double-strand breaks
  - (C) Insertions
  - (D) Deletions
12. miR-21 acts as :
- (A) Tumor suppressor
  - (B) Oncogene (oncomiR)
  - (C) Repair enzyme
  - (D) Growth factor
13. DNA hypermethylation of tumor suppressor genes leads to :
- (A) Activation
  - (B) Mutation
  - (C) Gene silencing
  - (D) Amplification
14. EGFR activation primarily triggers which pathway ?
- (A) DNA repair
  - (B) MAPK pathway
  - (C) Glycolysis
  - (D) Apoptosis
15. Which inhibitor directly suppresses cyclin-CDK activity ?
- (A) p21
  - (B) CDC25
  - (C) EGFR
  - (D) Ras
16. Cyclin D-CDK4/6 complex regulates :
- (A) S phase
  - (B) G1 phase
  - (C) G2 phase
  - (D) M phase
17. Which protein is known as "guardian of the genome" ?
- (A) RB
  - (B) MYC
  - (C) p53
  - (D) Ras
18. Loss of APC gene function leads to activation of :
- (A) PI3K pathway
  - (B) JAK-STAT pathway
  - (C) MAPK pathway
  - (D) Wnt/ $\beta$ -catenin pathway

19. Which drug is used to target KRAS G12C mutation ?
- (A) Erlotinib
  - (B) Sotorasib
  - (C) Imatinib
  - (D) Olaparib
20. A mutation locks Ras in GTP-bound form. What is the outcome ?
- (A) Cell cycle arrest
  - (B) Apoptosis
  - (C) Continuous proliferation
  - (D) DNA repair
21. Which model provides highest clinical relevance ?
- (A) 2D cell line
  - (B) CDX model
  - (C) PDX model
  - (D) PCR
22. Which approach is best to study drug resistance mechanisms ?
- (A) ELISA
  - (B) Longitudinal genomic analysis
  - (C) Microscopy
  - (D) Staining
23. Which is the most promising future direction in oncology ?
- (A) Radiation only
  - (B) Histology only
  - (C) Chemotherapy
  - (D) Multi-omics integration
24. Which therapy is most suitable for tumors with high TMB ?
- (A) Chemotherapy
  - (B) Immunotherapy
  - (C) Surgery
  - (D) Hormonal therapy
25. Which factor limits widespread use of genomics in cancer care ?
- (A) Lack of mutations
  - (B) High cost
  - (C) Low accuracy
  - (D) No clinical relevance
26. Which method best studies metastasis in vivo ?
- (A) 2D culture
  - (B) Organoids
  - (C) Mouse models
  - (D) ELISA

27. Which approach best overcomes tumor heterogeneity ?
- (A) Single drug therapy
  - (B) Combination therapy
  - (C) Radiation alone
  - (D) Surgery alone
28. Which strategy is most effective for early cancer detection ?
- (A) Liquid biopsy
  - (B) Surgery
  - (C) Chemotherapy
  - (D) Radiotherapy
29. Which model is best for predicting patient-specific drug response ?
- (A) 2D culture
  - (B) Organoids
  - (C) CDX model
  - (D) PCR
30. Which is the most effective approach for personalized cancer therapy ?
- (A) Chemotherapy
  - (B) Radiotherapy
  - (C) Genomic profiling
  - (D) Surgery
31. Which technique integrates genomic and proteomic data ?
- (A) PCR
  - (B) ELISA
  - (C) Flow cytometry
  - (D) Multi-omics
32. Which scenario represents gene-environment interaction ?
- (A) Random mutation
  - (B) Aging
  - (C) BRCA mutation + smoking
  - (D) DNA replication error
33. Which factor contributes most to metastasis ?
- (A) Apoptosis
  - (B) EMT
  - (C) DNA repair
  - (D) Cell cycle arrest
34. Which alteration leads to synthetic lethality with PARP inhibitors ?
- (A) BRCA mutation
  - (B) KRAS mutation
  - (C) TP53 mutation
  - (D) MYC amplification

35. Why are xenograft models limited in immunotherapy studies ?
- (A) Lack tumor growth
  - (B) Lack immune system
  - (C) High cost
  - (D) Poor vascularization
36. Which combination best explains tumor heterogeneity ?
- (A) Single mutation
  - (B) Stable genome
  - (C) Clonal evolution
  - (D) Uniform gene expression
37. A tumor shows high PD-L1 expression. What is the implication ?
- (A) Increased apoptosis
  - (B) Immune evasion
  - (C) Reduced angiogenesis
  - (D) DNA repair activation
38. A mutation increases KRAS signaling. Which pathway is affected ?
- (A) DNA repair
  - (B) Immune recognition
  - (C) Apoptosis
  - (D) MAPK signaling
39. Which model best mimics tumor microenvironment and drug penetration ?
- (A) 2D culture
  - (B) 3D spheroids
  - (C) PCR
  - (D) ELISA
40. A tumor has TP53 mutation and BCL-2 overexpression. What is the combined effect ?
- (A) Increased apoptosis
  - (B) Reduced proliferation
  - (C) Resistance to apoptosis
  - (D) Increased differentiation
41. Which hallmark is associated with telomerase activation ?
- (A) Angiogenesis
  - (B) Replicative immortality
  - (C) Immune evasion
  - (D) Metastasis
42. Which cancer type originates from epithelial cells ?
- (A) Sarcoma
  - (B) Leukemia
  - (C) Carcinoma
  - (D) Myeloma

43. Which technique is best for analyzing tumor heterogeneity ?
- (A) Western blot
  - (B) Single-cell sequencing
  - (C) ELISA
  - (D) PCR
44. Which genomic instability is associated with Lynch syndrome ?
- (A) Aneuploidy
  - (B) Chromothripsis
  - (C) Chromosomal instability
  - (D) Microsatellite instability
45. A patient has BCR-ABL fusion gene. Which drug is used ?
- (A) Erlotinib
  - (B) Imatinib
  - (C) Olaparib
  - (D) Nivolumab
46. A tumor shows high VEGF expression. Which therapy is suitable ?
- (A) PARP inhibitor
  - (B) Anti-PD1 antibody
  - (C) Bevacizumab
  - (D) Imatinib
47. Detection of EGFR T790M mutation is best achieved by :
- (A) Immunohistochemistry
  - (B) Liquid biopsy
  - (C) ELISA
  - (D) Flow cytometry
48. Which model is best for studying tumor-immune interactions ?
- (A) 2D cell culture
  - (B) Organoids
  - (C) Syngeneic mouse model
  - (D) Xenograft model
49. A tumor exhibits uncontrolled proliferation due to RB1 mutation. Which hallmark is affected ?
- (A) Immune evasion
  - (B) Angiogenesis
  - (C) Evasion of growth suppressors
  - (D) Metabolic reprogramming
50. A patient shows HER2 amplification in breast cancer. Which therapy is most appropriate ?
- (A) PARP inhibitor
  - (B) Trastuzumab
  - (C) Imatinib
  - (D) Bevacizumab

51. Which test evaluates gene expression profiles for prognosis in breast cancer ?  
(A) PCR  
(B) Oncotype DX  
(C) ELISA  
(D) Western blot
52. Which therapy directly enhances immune response against tumors ?  
(A) Chemotherapy  
(B) Radiation  
(C) Immunotherapy  
(D) Surgery
53. Which cancer is strongly associated with HPV infection ?  
(A) Lung cancer  
(B) Cervical cancer  
(C) Liver cancer  
(D) Colon cancer
54. Liquid biopsy primarily detects :  
(A) Tumor proteins  
(B) ctDNA  
(C) DNA repair enzymes  
(D) Ribosomes
55. Which molecular technique is most suitable for detecting HER2 amplification ?  
(A) PCR  
(B) FISH  
(C) ELISA  
(D) Southern blot
56. Which biomarker is used in prostate cancer screening ?  
(A) AFP  
(B) CA-125  
(C) PSA  
(D) CEA
57. Detection of BCR-ABL fusion gene is best achieved using :  
(A) ELISA  
(B) PCR  
(C) Western blot  
(D) Spectroscopy
58. Which screening method is used for early detection of cervical cancer ?  
(A) Mammography  
(B) PSA test  
(C) Pap smear  
(D) Colonoscopy
59. A mutation in EGFR is detected in a lung cancer patient. Which therapy is most appropriate ?  
(A) Chemotherapy  
(B) Radiation  
(C) Tyrosine kinase inhibitors  
(D) Hormone therapy

60. A 55-year-old smoker undergoes screening for lung cancer. Which is the most appropriate test ?
- (A) MRI
  - (B) Low-dose CT
  - (C) PET scan
  - (D) Chest X-ray
61. Which is the most comprehensive therapeutic approach ?
- (A) Target glycolysis only
  - (B) Target mitochondria + metabolism + apoptosis
  - (C) Surgery alone
  - (D) Radiation alone
62. Which biomarker is most promising for cancer diagnosis ?
- (A) mtDNA mutations
  - (B) ATP levels
  - (C) Lipid levels
  - (D) Protein synthesis
63. Which approach is best to target autophagy-dependent tumors ?
- (A) Induce autophagy
  - (B) Block apoptosis
  - (C) Increase glycolysis
  - (D) Inhibit autophagy
64. Which strategy is most effective for metabolic plasticity ?
- (A) Single pathway inhibition
  - (B) Multi-pathway inhibition
  - (C) Surgery
  - (D) Radiation
65. Which approach is best to block tumor nutrient supply ?
- (A) Increase glycolysis
  - (B) Inhibit glutaminolysis
  - (C) Activate PPP
  - (D) Increase lipids
66. Which therapy targets mitochondrial apoptosis directly ?
- (A) EGFR inhibitors
  - (B) Venetoclax
  - (C) Imatinib
  - (D) Erlotinib
67. Which pathway is the best target for biosynthesis inhibition ?
- (A) ETC
  - (B) Glycolysis
  - (C) PPP
  - (D) Autophagy

68. Which approach best exploits ROS imbalance ?
- (A) Antioxidants
  - (B) Pro-oxidant therapy
  - (C) Chemotherapy
  - (D) Surgery
69. Which therapy is most effective for apoptosis-resistant tumors ?
- (A) Antibiotics
  - (B) BH<sub>3</sub> mimetics
  - (C) Radiation
  - (D) Hormones
70. Which is the best strategy to target cancer metabolism ?
- (A) Increase glycolysis
  - (B) Inhibit glycolysis
  - (C) Increase OXPHOS
  - (D) Block DNA repair
71. Which factor promotes metastasis via mitochondria ?
- (A) Reduced ROS
  - (B) Increased apoptosis
  - (C) Altered mitochondrial dynamics
  - (D) Decreased metabolism
72. Why do cancer cells show metabolic flexibility ?
- (A) To reduce mutations
  - (B) To adapt to nutrient availability
  - (C) To decrease growth
  - (D) To inhibit signalling
73. Which process shows dual role in cancer ?
- (A) Glycolysis
  - (B) DNA replication
  - (C) OXPHOS
  - (D) Autophagy
74. What is the effect of Bcl-2 overexpression ?
- (A) Increased apoptosis
  - (B) Reduced apoptosis
  - (C) Increased ROS
  - (D) DNA repair
75. Why is lactate production beneficial to tumors ?
- (A) Increases oxygen
  - (B) Enhances immune response
  - (C) Acidifies microenvironment
  - (D) Reduces proliferation
76. Which factor links ROS to carcinogenesis ?
- (A) DNA repair
  - (B) DNA damage
  - (C) Protein synthesis
  - (D) Cell adhesion

77. Why do cancer cells exhibit mitochondrial hyperpolarization ?
- (A) Increased apoptosis
  - (B) Reduced ROS
  - (C) Resistance to apoptosis
  - (D) Reduced metabolism
78. How do mtDNA mutations contribute to cancer ?
- (A) Increase apoptosis
  - (B) Enhance OXPHOS
  - (C) Promote metabolic reprogramming
  - (D) Reduce proliferation
79. Which combination promotes tumor survival ?
- (A) High ROS + low antioxidants
  - (B) Low ROS + high antioxidants
  - (C) High ROS + high antioxidants
  - (D) Low ROS + low antioxidants
80. Why is aerobic glycolysis advantageous despite low ATP yield ?
- (A) Faster ATP production
  - (B) Reduced glucose uptake
  - (C) Increased oxidative stress
  - (D) Decreased proliferation
81. Which ROS acts as a signaling molecule at low levels ?
- (A) Hydroxyl radical
  - (B) Superoxide
  - (C) Hydrogen peroxide
  - (D) Nitric oxide
82. Autophagy primarily involves :
- (A) DNA replication
  - (B) Protein synthesis
  - (C) Degradation of cellular components
  - (D) Cell division
83. Which metabolic pathway uses glutamine as a carbon source ?
- (A) Glycolysis
  - (B) Glutaminolysis
  - (C) PPP
  - (D)  $\beta$ -oxidation
84. Which protein is anti-apoptotic ?
- (A) Bax
  - (B) Bak
  - (C) Bcl-2
  - (D) Bid

85. Which molecule initiates mitochondrial apoptosis ?
- (A) ATP
  - (B) Cytochrome c
  - (C) NADH
  - (D) FADH<sub>2</sub>
86. Which pathway provides NADPH for antioxidant defense ?
- (A) Glycolysis
  - (B) TCA cycle
  - (C) Pentose phosphate pathway
  - (D)  $\beta$ -oxidation
87. Mutation in mitochondrial ETC leads to :
- (A) Reduced ROS
  - (B) Increased ROS
  - (C) Increased ATP
  - (D) Reduced glycolysis
88. Which imaging technique is based on increased glycolysis in tumors ?
- (A) MRI
  - (B) CT scan
  - (C) FDG-PET
  - (D) X-ray
89. Why do cancer cells increase glucose uptake despite low ATP yield ?
- (A) To reduce ROS
  - (B) To generate biosynthetic intermediates
  - (C) To inhibit apoptosis
  - (D) To activate ETC
90. Cancer cells preferentially use glycolysis even in the presence of oxygen. This phenomenon is called :
- (A) Pasteur effect
  - (B) Warburg effect
  - (C) Crabtree effect
  - (D) Cori cycle
91. Which is the most comprehensive cancer treatment strategy ?
- (A) Surgery alone
  - (B) Chemotherapy alone
  - (C) Precision medicine approach
  - (D) Radiation alone
92. Which approach best addresses multi-pathway activation in cancer ?
- (A) Single drug therapy
  - (B) Radiation alone
  - (C) Surgery alone
  - (D) Combination targeted therapy

93. Which strategy is most effective against miRNA dysregulation ?
- (A) Chemotherapy
  - (B) miRNA mimics/inhibitors
  - (C) Radiation
  - (D) Surgery
94. Which method best prevents UV-induced cancer ?
- (A) Chemotherapy
  - (B) Surgery
  - (C) Sunscreen
  - (D) Antibiotics
95. Which approach is most suitable for viral-induced cancers ?
- (A) Antibiotics
  - (B) Vaccination
  - (C) Radiation
  - (D) Surgery
96. Which therapy is best for cancers with CDK over activation ?
- (A) EGFR inhibitors
  - (B) Immunotherapy
  - (C) PARP inhibitors
  - (D) CDK4/6 inhibitors
97. Which approach best targets Ras-driven cancers ?
- (A) Direct Ras inhibition
  - (B) Blocking downstream pathways
  - (C) Radiation
  - (D) Surgery
98. Which strategy is most effective against epigenetic silencing ?
- (A) DNMT inhibitors
  - (B) Antibiotics
  - (C) Radiation
  - (D) Surgery
99. Which approach is best to restore tumor suppressor function ?
- (A) Activate oncogenes
  - (B) Increase methylation
  - (C) Gene therapy
  - (D) Radiation
100. Which is the most effective strategy to target EGFR-mutant cancer ?
- (A) Chemotherapy
  - (B) EGFR inhibitors
  - (C) Surgery
  - (D) Radiation

***(Only for Rough Work)***

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

**Example :**

**Question :**

Q. 1 (A) ● (C) (D)

Q. 2 (A) (B) ● (D)

Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

**Impt. :** On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

**उदाहरण :**

**प्रश्न :**

प्रश्न 1 (A) ● (C) (D)

प्रश्न 2 (A) (B) ● (D)

प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

**महत्वपूर्ण :** प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।